

23 days. The most important frosts were those of the closing 4 days of the month, when the formation was heavy or killing in all except extreme southeastern sections. Special attention was given to the warnings for Nebraska, Iowa, and Illinois, owing to the critical condition of the corn crop in respect to seed; and it is known that because of the warnings much seed corn was saved. Then, too, the warnings for the cranberry interests in Wisconsin served a useful purpose, as indicated in several letters that have come to hand. At the close of the month warnings were no longer being issued for most of the Northern Rocky Mountain region, the growing season there having terminated.

Storm warnings.—On the Great Lakes, particularly on the Lower Lakes, the month was more inclement than the average September. Storm warnings were issued on six days, and small-craft warnings on five other days.

No warnings of any character were issued until the 12th, although disturbances on the 2d and 5th caused gales of brief duration over central Lake Erie, and on the 8th–9th over part of the eastern Lake region, including extreme eastern Lake Superior. In some instances the winds referred to occurred in connection with thunderstorms.

On the 12th either southwest or northwest warnings were issued for practically all the Great Lakes, in connection with a disturbance over northern Lake Michigan, but the warnings were lowered in the evening, when the force of the storm appeared to have been spent. Generally speaking, the warnings were well verified.

The remainder of the second decade was mostly quiet, but on the morning of the 21st, with a disturbance of rapidly increasing energy central over southern Minnesota, warnings were issued for the Upper Lakes, and 12 hours later for the Lower Lakes. The center of the storm moved rapidly north-northeastward and later northeastward, and by the evening of the 22d had practically disappeared from the field of observation. The warnings issued in this connection were for the most part verified.

On the morning of the 26th a disturbance in the form of a trough and of some depth covered the Plains States, and at the same time a large high pressure area overlay the northeast, thus creating a marked gradient. Accordingly, warnings were issued for most of the Upper Lakes section. On the following morning, with the storm then decreasing in strength, small-craft warnings were advised for all the Great Lakes, except Lake Ontario.

Small-craft warnings were advised for the Lower Lakes on the 29th, when a disturbance of increasing energy covered the Middle and South Atlantic States, and indicated an almost due northward movement. As a result of afternoon special observations northeast storm warnings were issued for Lake Ontario, and at night these were extended westward on Lake Erie to the Cleveland district. The only verifying winds within the 36-hour period occurred at Cleveland, although 60 miles was reached at Buffalo, N. Y., on October 1.

The fire-weather forecasts for western Montana were discontinued for the season on the 20th, and those for the benefit of fruit interests in Door County, Wis., and southwestern Michigan, on the 30th.—*C. A. Donnel.*

NEW ORLEANS FORECAST DISTRICT

No storm occurred on the west Gulf coast during the month and no storm warnings were issued from New Orleans. Small-craft warnings were displayed on part

of the Texas coast on the 12th, and all the Texas coast on the 28th.

Storm warnings were issued from the Central Office for New Orleans and Burrwood on the 13th and 14th, and for Burrwood on the 29th, but no storm verifying velocities occurred.

Frost warnings were issued on the 27th for the northwestern portion of the district, and on the 28th and 29th for the northern portion, and light frost occurred in scattered localities on the 28th, 29th, and 30th. No frost warnings were issued on the 20th, because at the rate the high-pressure area was traveling it would have been too far east by October 1 to give frost in this district; but it dropped southward with a slower eastward movement and light frost occurred in scattered localities in eastern Arkansas and northern Louisiana.—*I. M. Cline.*

DENVER FORECAST DISTRICT

Areas of low atmospheric pressure, followed by areas of high, crossed the district three times during the month, causing sharp falls in temperature, while at the beginning of the month another temperature and pressure transition was in progress. Warnings of frost were necessary and were issued for various appropriate portions of the district on the 1st, the 11th to 13th, the 18th to 22d, and the 25th to 29th, inclusive. Warnings of freezing or lower temperatures were included on the 20th for southwestern Colorado, northeastern Arizona, southern and extreme northwestern Utah, on the 21st for southwestern and exposed places in northern and eastern Colorado, northwestern New Mexico, northeastern Arizona, and exposed places in Utah; on the 26th for western Colorado, northwestern New Mexico, northeastern Arizona, and Utah; on the 27th for northwestern New Mexico and northeastern Arizona, and for exposed places in Colorado and Utah; on the 28th for southwestern Colorado and northwestern New Mexico, and on the 29th for exposed places in southwestern Colorado. On mornings subsequent to those on which the foregoing warnings were issued, temperatures were experienced far enough below freezing to kill green crops in the colder sections, while much damage was done to crops in the milder sections by temperatures of freezing and below.

As a result of the unusually dry summer a high fire hazard prevailed during a considerable portion of the month, consequently daily advice was published relative to the hazard in the forested districts, particularly for Colorado. The rains from the 9th to the 11th were especially beneficial in reducing the hazard for a time. Special warnings were issued on the 19th and 25th for southern Utah, Arizona, and New Mexico for increasing westerly winds which would add to the danger, due to the influence of low-pressure areas moving over the sections named without causing appreciable precipitation. The increase in the wind subsequent to the warning of the 25th was most pronounced, velocities of 46 miles an hour from a westerly direction being reported from the Weather Bureau stations at Modena, Utah, and Albuquerque, N. Mex.

Owing to the extremely low water in the lower Colorado River and the resultant heavy losses in the adjacent irrigation districts, numerous requests were answered relative to the probable rise that would be caused by the heavy rains which fell in the middle and upper drainage areas from the 9th to the 11th.—*Lawrence C. Fisher.*

SAN FRANCISCO FORECAST DISTRICT

The month was marked by a continuation of dry weather in California and by dry weather but with occasional local rains elsewhere until after the 18th, when more or less general rains occurred over the north Pacific States and Idaho. These rains were particularly beneficial in that they terminated a prolonged period of high forest-fire hazard in these regions. The only marked change to cooler weather generally over the district occurred during the period beginning on the 18th and ending on the 26th, when warnings of frost or of freezing temperature were required for Nevada and Idaho and the eastern parts of Washington and Oregon. It is worthy of note that this spell of unseasonably low temperatures followed an abnormal rise in pressure over the Bering Sea and the Aleutian Islands. The peak of high pressure occurred over the Bering Sea region on the 19th of September, followed by a rise to abnormally high pressure over the northern portion of this forecast district, which reached its maximum on the 26th and 27th. Southwest storm warnings were displayed on the 20th and continued on the 21st and 22d on the coast north of Cape Blanco. The first display was made well in advance of the occurrence of storm winds, which blew with gale force at and north of the mouth of the Columbia River. Again on the 29th, southwest storm warnings were displayed for the same area and were followed by winds of gale force during the 30th day of the month.

In the valleys of California there were no rains of appreciable amount to interfere with the drying of fruits, although on the 1st and on the 30th advisory information was sent to protect fruit, when the conditions were somewhat threatening.

The forest fire situation was acute during the entire month in California and during several periods in Washington, Oregon, and Idaho. Daily advices were issued to cover the forest-fire hazard resulting from the dangerous weather conditions.

The following letter from the California State Board of Forestry, dated September 18, 1924, addressed to the Weather Bureau office, Sacramento, has been received:

I wish to express my appreciation of the valuable service which you have rendered us this summer in notifying us of the approach of hot spells, low humidity and strong winds. On two occasions I have notified the State rangers that hazardous fire conditions were approaching after receiving information from your office to that effect. This information has enabled the rangers to prepare for these situations and probably has resulted in the saving of much valuable timber and watershed cover.

A continuance of the very efficient service which you have rendered the California State Board of Forestry will be much appreciated.

This communication was signed by State Forester M. B. Pratt.—*E. H. Bowie.*

627.41 (73)

RIVERS AND FLOODS

By H. C. FRANKENFIELD, Meteorologist

As will be seen in the table following, no floods of importance, except those beginning on the 30th and continuing into October in the Atlantic drainage area occurred in the principal rivers of the United States during September, 1924. That of the Illinois River, which was reported in the August number of this REVIEW, continued well into the month without additional damage of consequence. Along the lower Rio Grande some slight inconvenience and expense resulted, following the 25th, from moderate overflows and the

necessity of repairs to and the patrolling of levees. The scattered mid-month rises in the Atlantic drainage area—specifically those in the Connecticut, Saluda (of South Carolina), and Broad (of Georgia) Rivers—were without serious damage. The more general floods that continued into October in the Atlantic area, which were of considerably greater extent and consequence, will be discussed in the October number of this REVIEW. Sufficient data are not now available.

Lock No. 8, Tennessee, on the Cumberland River was opened for service on September 15, 1924. This lock is 17.8 miles above Lock 7, and 124 miles above Nashville, Tenn. The normal pool stage maintained between Locks 7 and 8 is 6.0 feet, and the same above Lock 8 to Granville, Tenn., a distance of 16 miles. From Lock 8 to Lock 21, a distance of 173 miles, there are no locks and dams. The following item has been received from Mr. Roscoe Nunn.

The locks on the Cumberland River are now completed from Eddyville, Ky., up to Lock 8, and all-the-year navigation is possible in this part of the river, or from Eddyville, Ky., to Granville, Tenn., a distance of 290 miles. Below Eddyville, however, a 6-foot stage will not be available in the low-water season until a lock on the Ohio River, just below the mouth of the Cumberland, is completed. Work on this lock has just been started and it is expected that it will not be finished until 1929. The dam at this lock when in operation will back up the water to Lock F, Eddyville, making a 6-foot stage. Eddyville is 43 miles above the mouth of the Cumberland.

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC DRAINAGE					
	<i>Feet</i>			<i>Feet</i>	
Connecticut: White River Junction, Vt.	15	11	14	15.9	13
Lehigh: Mauch Chunk, Pa.	12	30	(C)		
Schuylkill: Reading, Pa.	10	30	(C)		
Susquehanna: Binghamton, N. Y.	14	30	(C)		
Chenango: Sherburne, N. Y.	8	30	(C)		
James: Columbia, Va.	18	30	(C)		
Roanoke: Weldon, N. C.	30	30	(C)		
Tar: Rocky Mount, N. C.	9	30	(C)		
Fishing Creek: Enfield, N. C.	15	30	(C)		
Neuse:					
Neuse, N. C.	15	30	(C)		
Smithfield, N. C.	14	30	(C)		
Cape Fear:					
Fayetteville, N. C.	35	30	(C)		
Elizabethtown, N. C.	22	30	(C)		
Haw: Moncure, N. C.	22	30	(C)		
Waccamaw: Conway, S. C.	7	28	(C)		
Black: Kingstree, S. C.	12	29	(C)		
Santee:					
Rimini, S. C.	12	17	(C)	15.3	27
Ferguson, S. C.	12	18	(C)		
Catawba: Catawba, S. C.	12	30	(C)		
Congaree: Columbia, S. C.	15	30	(C)		
Broad: Blair, S. C.	15	29	(C)		
Saluda:					
Palzer, S. C.	7	21	22	10.0	22
		30	(C)		
Chappells, S. C.	14	16	16	14.1	16
		24	24	14.0	24
		30	(C)		
Broad: Carlton, Ga.	11	26	26	11.6	26
Oconee:					
Milledgeville, Ga.	22	26	(C)	31.5	26
Dublin, Ga.	22	29	(C)		
Ocmulgee: Macon, Ga.	18	30	(C)		
MISSISSIPPI DRAINAGE					
Shenango: Sharon, Pa.	9	30	(C)		
Holston (North Fork): Mendota, Va.	8	30	(C)		
Illinois:					
Peru, Ill.	14	(C)	9	19.8	Aug. 11
Henry, Ill.	7	(C)	25	13.7	Aug. 23, 24
Peoria, Ill.	16	(C)	10	21.0	Aug. 24
Havana, Ill.	14	(C)	11	19.0	Aug. 25
Beardstown, Ill.	12	(C)	21	19.1	Aug. 28, 29
Pearl, Ill.	12	(C)	10	15.7	Aug. 30
WEST GULF DRAINAGE					
Rio Grande:					
Rio Grande City, Tex.	15	25	25	15.0	25
San Benito, Tex.	21	18	29	24.2	27

1 Continued at end of month.

2 Continued from last month.